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15 June 1984

Worldwide Report

NUCLEAR DEVELOPMENT AND PROLIFERATION

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WORLDWIDE REPORT

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NEAR EAST/SOUTH ASIA

SUB-SAHARAN AFRICA

GERMAN-BUILT POWER PLANT, PAKISTANI URANIUM MAY EQUAL IRANIAN BOMB

Paris LIBERATION in French 27 Apr 84 p 23

[Article by Dominique Leglu]

[Text] The West German firm which started the construction of a nuclear power plant in the south of Iran, says that it will not finish its work before the end of the Iran-Iraq war.

"Iran might be building an atomic bomb which could be ready in two years." This information, published yesterday in the British weekly JANE'S DEFENSE WEEKLY (an authority on weapons and defense matters), is in itself a bomb. Especially since the chief editor, Robert Hutchinson, quoted by the HERALD TRIBUNE, says that all the information has been verified and that the hypothesis is sound, adding that the Iranians are progressing very rapidly toward their goal.

Actually, JANE'S information comes from last week's Persian Gulf press, leading us to believe that the story is a damp firecracker cleverly coated with poison. "Atomic bomb rumors are rife in this region of the world," indicated yesterday a French observer, whose attention was drawn several weeks ago by another bit of information, according to which Iraq would also have--or at least have very soon--an atomic bomb. At this point it is difficult to believe any hypothesis. The only certainty is that everything is possible, and that it all is only a matter of time.

According to the information printed in the weekly, the bomb would be built in the south of the country, near the town of Boucher. This is not a coincidence, since that is where the West German engineers of Kraft Werk Union (KWU) started to build a 1300 megawatt nuclear power plant before the 1979 revolution. The work was interrupted during the revolution and all the contracts were cancelled.

The news is that 44 West German engineers have returned to the construction site a little over two months ago. According to a statement from KWU, their objective is to "evaluate the possibilities for resuming construction." Their task should last until June because the construction site has to be examined

in detail if the project is to be resumed. AEC estimates that more than one-half of the plant had already been built; in any case, it was more advanced than the French-Iranian projects for two 900 MW reactors that Framatome was to have produced.

According to French sources, it is actually doubtful that Iran has on its soil the nuclear fuel which would allow it to work on a bomb project. On the other hand, Khomeyni's country does indeed own enriched uranium: as member of the Eurodif company, Iran has to buy 10 percent of its 3 percent enriched uranium. But deliveries have been stagnant since 1979. Yet, if the plant were ready to operate, Eurodif could without difficulty deliver the 75 tons of enriched uranium needed for the installation. In any case, "the plant, in its present condition of 80 percent completion, does not allow the construction of a bomb." The problem is to know whether this 1300 MW pressurized water reactor (PWR), which the Germans know how to build, can rapidly lead to the production of a bomb.

Raymond Sene, one of the authors of the report on Osirak, the Iranian reactor bombed by the Israeli Air Force in June 1981, does not mince words: "If we write some horror-fiction, and if we consider a not very powerful little bomb, the latter becomes possible by puttering about with a PWR power plant."

To make a bomb, one needs a minimum of six kilograms of either very enriched uranium, or plutonium. To obtain it, one has to start by irradiating uranium; and while a PWR plant is not the ideal means with which to do it, it is nevertheless still possible to carry it out.

The core of the plant, the site of the nuclear reactions that produce the heat necessary for generating electricity, is very protected.

One-third of the fuel is usually changed every year. At that time, everything must be brought to a halt, particularly the pressurized water loop, and the pieces of irradiated fuel must be carefully recovered. A power plant does not produce the best "military" fuel, because a material that has been overly irradiated yields (a plutonium) that does not make very good bombs.

But these difficulties can be skirted: "The installation simply has to be halted one month after the plant has begun production," explains Raymond Sene. "At that point, a 1300 MW plant has created 20 kg of plutonium. But it will still be buried within the fuel elements, and the whole problem consists in reprocessing them properly." That is where the horror-fiction can begin. If one does not have high performance remote handlers that make it possible to cut the material before its chemical treatment (with nitric acid, which dissolves plutonium and uranium), one can possibly use human power. There would be about 100 tons of material to be reprocessed, "an operation which could take one year and yield about 10 kg of plutonium under rudimentary hand-work conditions," according to Raymond Sene's estimate.

And even if an actual bomb would not be built, a nuclear power plant can be misused in another way. As an example, the fission products of the core could be scattered on a battlefield or in enemy towns. The transportation requires kamikazes of course, but that is probably not a problem for Khomeyni.

And lastly, one might not want to underestimate another hypothesis, which ultimately has no relation to the Boucher plant. A French observer points out that Pakistan could directly supply Iran with very enriched uranium, which has nothing to do with the poorly enriched (3 percent) uranium from Eurodif. At one time, the Pakistanis adopted a method for ultracentrifuge processing of this material, derived in fact from methods developed by the Germans. All in all, no hypothesis can be excluded, and Khomeyni has every interest in keeping several irons in the fire if he wants to have a bomb very soon. He can obtain very enriched uranium on one hand, and plutonium from the plant on the other.

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CSO: 5100/2560

MELBOURNE CITES FIJI MINISTER ON FRENCH N-TESTS

BK150634 Melbourne Overseas Service in English 0500 GMT 15 May 84

[Excerpts] The Soviet Union and Fiji have strongly criticized the latest French nuclear test in the South Pacific.

Fiji's minister for foreign affairs, Mr. Jonati Mavoa, has expressed concern at France's continued nuclear testing in the South Pacific. Mr Mavoa said the Fiji Government was deeply disappointed that France had conducted more nuclear tests despite very strong protests from Fiji and other countries in the region. We warned that while Fiji valued its overall relationship with France, the continued testing would affect the further extension of these relations.

Reports from New Zealand said France had exploded its second nuclear device in 4 days on Mururoa. Scientists estimated the latest blast had a yield of 50 kilotons--the largest in almost a year.

CSO: 5500/4384

HONG KONG WARNED IT MAY BE AIDING PRC NUCLEAR WEAPONS PLAN

Hong Kong SOUTH CHINA MORNING POST in English 11 Apr 84 p 10

[Article by John McLean]

[Text]

A leading environmentalist has argued that Hongkong electricity consumers, by helping to finance the Daya Bay atomic power station, may be helping the proliferation of nuclear weapons.

The chairman of Hongkong Friends of the Earth, Ms Linda Siddall, said yesterday that technology imported by China for the Daya Bay plant may be re-exported to countries which could use the know-how to develop nuclear weapons.

She was addressing the energy committee of the American Chamber of Commerce.

Ms Siddall called on the Hongkong business community to use its influence to halt the construction of the Daya Bay plant.

"China is, of course, already a nuclear weapons power," she said.

"That does not mean the supply to her of a foreign civil reactor is without possible weapons significance.

"Both China and France have refused to sign the non-proliferation treaty aimed at preventing the spread of nuclear technology and materials.

"It seems possible, and perhaps probable, that Hongkong electricity consumers may end up helping to finance China's nuclear arsenal, and facilitating the spread of nuclear technology to other countries which also reject non-proliferation safeguards."

Ms Siddall urged Hongkong businessmen to apply the "trimtab" concept to prevent the construction of the Daya Bay plant, and so help prevent the spread of nuclear weapons.

The trimtab concept was postulated by American businessman Harold Willens in his book *The Trimtab Factor*.

In the book he suggested how businessmen, by applying a small amount of pressure, could exert their influence to stop the nuclear arms race, which, he argued, is the ultimate in bad business practice.

"Unhappily we are rapidly reaching the stage where we may need to worry less about superpower nuclear arsenals than those in the hands of unstable dictatorships, obtained under the guise of civil nuclear programmes," said Ms Siddall.

She said that unless opposition to nuclear weapons was paralleled by opposition to the construction of atomic power plants, global safety would not be achieved.

"The Hongkong business community has always been quick to seize upon good ideas from overseas.

"The trimtab concept seems to me to be a compellingly good idea, with obvious reference to Daya Bay."

Ms Siddall said that India had already exploded a nuclear bomb which used plutonium from an atomic reactor exported by Canada for civil purposes.

She added that several other countries with nominally civil atomic programmes — including Argentina, Brazil, Israel, Pakistan and South Africa — were on the brink of building their own nuclear weapons.

"Nuclear power proponents say that using a civil reactor to produce weapons grade plutonium is like using an ocean liner to cross the harbour.

"Technologically that may be true. But politically it is irrelevant.

"A Third World government wishing to produce nuclear weapons the 'direct way' would have to build and pay for the necessary facilities itself and in secret to avoid international uproar.

"Going the indirect, civil route, on the other hand, involves getting facilities provided and financed to a large extent by foreign suppliers and operated openly — indeed, regarded as a mark of international prestige.

"If the civil programme includes an enrichment or reprocessing plant, the government in question can be within weeks of weapons capability without attracting serious opposition."

CSO: 5140/001

PRC-BRAZIL NUCLEAR PACT PREPARED

PY190050 Rio de Janeiro JORNAL DO BRASIL in Portuguese 18 May 84 p 13

[Text] Brasilia -- Itamaraty announced last night the "satisfactory conclusion" of negotiations with the PRC for signing a memorandum of understanding on nuclear cooperation during the visit of President Figueiredo to Beijing next week. Itamaraty's spokesman Bernardo Pericas explained that the memorandum will serve as the basis for a nuclear agreement to be signed between Brazil and the PRC "in the not remote future."

The negotiations held in Beijing about the memorandum were conducted by Foreign Minister Saraiva Guerreiro's main adviser on economic affairs Roberto Abdenur, and by Wu Heng of the State Science and Technology Commission. The negotiations lasted all week and ended yesterday.

After signing nuclear cooperation agreements with the FRG, and with the United States lately, the PRC will accept Brazil as its first partner among developing countries in the nuclear area. According to information transmitted to Brasilia by Abdenur yesterday, the memorandum establishes an initial program of cooperation that will constitute the framework for an agreement in the future. The program has exclusively peaceful objectives in the following area: 1) basic research on peaceful uses of nuclear energy; 2) uranium technology, research, prospecting, and processing; 3) reactor research, project planning, construction and operation; 4) fuel elements manufacture; 5) use of radioisotopes; and 6) installation safety.

Although the PRC has already exploded nuclear bombs using technology acquired in joint programs with the Soviet Union, the PRC, like Brazil, is opposed to the non-proliferation treaty, considering it discriminatory against poor countries.

The nuclear cooperation agreement with the PRC will be the 16th such an agreement for Brazil. Before, similar agreements were signed with the FRG (the basis for the Brazilian nuclear program), Argentina, United States, Bolivia, Chile, Colombia, Venezuela, Ecuador, Iraq, Israel (a convention), Italy, Paraguay, Portugal, and the European Atomic Community (Euratom).

CSO: 5100/4129

ALFONSIN SPEAKS ON NUCLEAR ENERGY

Visit to Nuclear Plants

PY111911 Buenos Aires Domestic Service in Spanish 1530 GMT 11 May 84

[Speech by President Raul Alfonsin when visiting Nuclear Plants Atucha I and II in Lima, Zarate County, Buenos Aires Province--live]

[Excerpts] Mister President of the National Atomic Energy Commission [CNEA], gentlemen:

The country has suffered a profound recession in its socioeconomic development, which has caused a dramatic deterioration of the standard of living of its citizens. To reverse this situation now implies resorting to the maximum use of our own creative capacity, channeling it toward clear, consistent objectives, and creating a climate of appropriate achievements.

The country stands out for having achieved a consistent scientific and technological development in the nuclear field, through more than 30 years of activity of a highly disciplined group of persons whose capacity and tenaciousness are reflected in the achievements we can see today.

From the very beginning the Argentine nuclear program was aimed at achieving a creative capacity and a technological development which would allow us to obtain the maximum autonomy in this field. The effort made to reach the proposed objectives has made it possible for the country, a few years after the creation of the CNEA, to see the results of its efforts through these positive achievements.

Thus, through the program for the production of radioisotopes and the use of production of radiation sources, our citizens have access to one of the most advanced technologies in medicine, and at the same time, to a valuable tool to face and solve important problems in the agriculture and livestock sectors, a tool which is also valuable for engineering, industries, and for environment protection.

Later, the scientific and technological training gained in this activity allowed a gradual but consistent development in different technological sectors which aims at granting the necessary capacity for the production of nucleoelectric energy, with full decisionmaking power.

In this regard, I also want to stress the capacity achieved in mastering the fuel cycle, and the efforts being made to reach self-sufficiency in producing heavy water and several nuclear components and inputs, and particularly the fact that we have achieved, with our own effort, a national technology for enriching uranium. It is also appropriate to mention the progress made in matters of industrial architecture and engineering, which will allow the construction of new nuclear plants with a more significant increase in national participation.

In order to guarantee the achievements obtained and the role which the generation of nuclear electricity will undoubtedly play to meet the demands for energy during the next century, my government intends to submit to the honorable Congress of the nation a nuclear bill to guarantee that the objectives of this sector be established through the powers obtained through the vote of the citizenry; to guarantee the peaceful nature of these objectives for the present and the future; to grant the necessary authority and flexibility to the CNEA, as an organization that implements the Argentine nuclear program; to guarantee the state monopoly over the development, acquisition, and use of nuclear technology as a means to ensure that it will be at the exclusive service of the great national interests; to grant to the national authority for protection against nuclear radiation the necessary autonomy for the full exercise of its functions in defense of the health of the people and of the environment.

The government also intends, through careful energy planning, to make the objectives of the current Argentine nuclear program compatible with the country's possibilities to make investments, making sure that nuclear activities as a whole will have an adequate development.

We are aware of the serious difficulties the Argentine nuclear industry is facing today, due to the serious economic problems we have encountered on assuming the government. We are also aware of the limitations which, for similar reasons, the CNEA professionals and technicians must overcome in trying to attain the objectives established for their activities.

Atomic Energy Day Celebration

PY311925 Buenos Aires Domestic Service in Spanish 1600 GMT 31 May 84

[Excerpts] President Raul Alfonsin today presided over a ceremony to commemorate Atomic Energy Day, which was held at the San Martin Cultural Center. CNEA [National Atomic Energy Commission] President Alberto Constantini, Buenos Aires Mayor Julio Cesar Saguier, and other high-ranking officials were in attendance. Engineer Constantini opened the ceremony by highlighting its importance. Dr Raul Alfonsin delivered the closing speech. Here are his words:

[Begin Alfonsin recording] Exactly 20 days ago, I had the pleasure to visit Atucha, one of the CNEA plants. During my visit, I noticed in all the professionals and technicians who guided me and in all the scientists, engineers, administrative employees, and workers who listened to my speech the same passion for their work, the same faith in their contribution to the country's activation, the same fervent desire to continue with their work, and the same love for this 34-year-old institution. On that occasion, I made a firm decision to participate with you in this ceremony in order to express to you my sincere congratulations for your work, and to express my promise, as president of the nation, to support your efforts in order to ensure the continuation of your work.

During our party's electoral campaign and in the government plan I disclosed when taking over the presidency on 10 December, 1983, we established the objective of attaining real national sovereignty through the promotion of scientific and technological activities, as they are the main elements that enable a country to excercise its decisionmaking power and make achievements in all sectors. I am convinced that only after our country obtains this power will it be able to adopt the measures necessary to improve the economy, increase the standard of living of its people, and contribute to the general well-being, not only of its people but also of our brotherly American countries.

On such an important day for you all, I express my wishes for this institution that it continue with its brilliant work in order to contribute to the economic and social development of the Republic. [end recording]

CSO: 5100/2105

CASTRO MADERO ON URANIUM ENRICHMENT, CAPABILITY, BENEFITS

Buenos Aires LA NACION in Spanish, 18, 19 Jun 84

[18 Jun 84 p 9]

[Excerpts] The importance that it has assumed for the country to have achieved mastery of the technology for uranium enrichment does not seem to have been properly assessed by the public, partly because of the technical nature of the matter, but also because of the meager dissemination given to the complete text of the pertinent announcement. Hence, it is worthwhile analyzing all features of this major technological development, so that it may be subjected to a correct evaluation.

Argentine Policy

When Argentina decided to build its first reactor for radioisotope production, based on technical and economic considerations, it opted for a design using enriched uranium as fuel. Concurrently, it signed a cooperation agreement with the U.S. which ensured the supply of that fuel, in continuous fashion, throughout the entire useful life of the reactor.

But when Argentina had to select the reactor line for its nuclear electric powerplants, it did so consistently on the basis that this line should clear the way toward its independence. Therefore, it correctly chose the natural uranium line which, because it does not require enrichment, affords, not without great effort, access to the total mastery of the fuel cycle; an essential requisite for having autonomy in this field. Its opportunities for acquiring the technology for uranium enrichment were almost non-existent, in view of the latter's high degree of complexity, in addition to the large investment demanded to set up a plant with a capacity to supply a nuclear electric powerplant program. Nevertheless, when its technological development enabled it to invade the international market through the exporting of reactors for radioisotope production, the great weakness entailed by lacking the capacity to produce enriched uranium became apparent. On the one hand, this situation was gainfully exploited by its competitors; and, on the other, the normal sources of supply made the provision thereof contingent on submission to treaties considered to be discriminatory. It was clearly proven that, in order to compete with chances of success on the international nuclear market, it is indispensable to appear as a complete, reliable supplier; in other

words, with a capacity to provide all the supplies pertaining to the nuclear fuel cycle without limitations of any kind.

Decision to Enrich Uranium

The decision to undertake, in the country, without outside assistance, the enrichment of uranium was made precisely in 1978, when the U.S., our traditional supplier of enriched uranium, unilaterally gave notice of the termination of the aforementioned cooperation agreement with our country, and made the continuation of its supply contingent not only on the subjection of all our nuclear facilities, both present and future, to international safeguards, but also on a waiving of continued development of the reprocessing technology.

The lack of supply of enriched uranium directly interfered with our ability to maintain the national supply of radioisotopes used primarily in medicine, as well as in other fields of science and technology; because their production results from the operation of the irradiation reactor which, as has been noted previously, operates with enriched uranium.

It also made it impossible to operate the research and teaching reactor installed in the Bariloche atomic center, an essential tool for the nuclear engineering course given at that center as an important part of the plan for training highly qualified human resources. Another very negative impact was the one projected over our potential for playing the role of a supplier of irradiation reactors in the Latin American area, with all the geopolitical implications in the realm of regional integration that this represents. That impact was felt in the commitment assumed with Peru for the construction of a nuclear center in which, because no enriched uranium was available, it became necessary to resign ourselves to an outside supplier for the manufacture of fuel elements for the irradiation reactor designed and built by us as an essential part of that center, despite the fact that we had mastered the technology for this manufacture.

Added to these reasons associated with research and teaching reactors and radioisotope production, which more than compensate for the risk assumed in attempting to develop the enrichment technology, are other attractive economic and technological features.

Among the most significant of these is the ability to operate our nuclear electric powerplants with slightly enriched uranium (on the order of 1 percent). This makes it possible to cut in half the consumption of fuel elements for the same energy produced; which, in the case of the Atucha I nuclear powerplant, means a cut of about 30 percent in the cost of the fuel, which in turn is translated into a 10 percent reduction in the cost of generating the electric power.

Considering the amount put into the enrichment process, there is also a 20 percent cut in the amount of uranium per unit of electric power generated in our heavy water reactors; which is equivalent to increasing the country's uranium reserves to that extent.

Another advantage is being able to use again more than 2,500 fuel elements already irradiated at the Atucha I nuclear powerplant, which are stored in the

decay pools awaiting their final destination. This, combined with the resultant increase in storage capacity that these pools will have as a consequence, represents, of itself, a savings of about $70 million.

It is particularly important to stress here the fact that the natural uranium and heavy water powerplants benefit from complete reversibility for using natural uranium or slightly enriched fuel elements, without distinction; and, therefore, having the latter at their disposal, the powerplants, and the management of their fuel cycles, are endowed with great operational flexibility.

Hence, these opportunities do not in any way imply the feasibility of a change in the policy established regarding the natural uranium and heavy water line adopted by the country for its powerplants; but rather, on the contrary, the possible application of a slight enrichment will, as has been noted, allow for an even greater maximizing of the advantages inherent in this type of powerplant.

Moreover, it should be considered that, in order to procure this slight enrichment, it is not necessary to build the large enrichment plants required to supply a program of powerplants with enriched uranium and light water; and that, therefore, the investments demanded are quite within the reach of our economic potential.

Another major advantage offered by having enriched uranium available is the freedom that it offers for undertaking the construction of an experimental reactor with sufficient power to subject the fuel elements and structural materials for nuclear use to neutronic irradiation tests. This type of reactor which, for technical and economic reasons, is more feasible if based on 20 percent enriched uranium, is a key part of the infrastructure for supporting innovations and new technological development, in order to achieve additional reductions in the cost of nuclear electric generation and maintain the mastery of a technology that is constantly evolving.

(In the next article, Adm Carlos Castro Madero concerns himself with the criticism made after the announcement of Argentina's mastery of the technology for uranium enrichment.)

[19 Jun 84 p 7]

[Text] Among the opinions evoked by the announcement that the country had attained mastery of the technology for uranium enrichment there were some that discredited it, attributing to it military purposes, or those based on negative arguments regarding the spending carried out, or the savings and effectiveness of the developed method. Those aspects will be analyzed in the following.

Military Applications of Uranium Enrichment

It is unquestionable that any heightening of the capacity for achievement in the nuclear area entails, in addition, a heightening of the capacity to produce an explosive; but it is not fair to view all progress made in the nuclear field

from this perspective. The goals pursued with this successful development were detailed in the first part of this article and are, without exception, goals with exclusively peaceful applications. For this reason, the plan has been designed to produce enrichments that are far lower than those needed to manufacture nuclear weapons.

In addition, this decision is backed by an undeviating course of action followed constantly by the CNEA [National Commission for Atomic Energy] since its creation, the result of a thoughtful, firm conviction that nuclear energy must be a tool for unity and progress in Latin America. This requires precluding any nuclear weapons development, because that would be directly at odds with these two priority objectives.

Cost of the Pilcaniyeu Plant Development

One expression of criticism was summarized in the comment: "To enrich the uranium, the country has been impoverished." The project development has been totally covered by funds allocated yearly in the respective budgets of the National Commission for Atomic Energy. Throughout the 5 budgetary fiscal years during which it has been developed, its historical cost has amounted to the sum of 112,132,000 Argentine pesos, equivalent to $62,585,000 current dollars. With this small investment, a technology the value of which is inestimably greater was procured.

There are no precedents in the country, nor do I think there are any abroad, showing such an optimal income return from funds invested as in this instance, surprising experts all over the world. It should be stressed that, of the funds invested, the purchase of goods abroad represented an investment of only 15.6 percent of the aforementioned figure ($9.76 million); and hence the remaining 84.4 percent has been turned over for the payment of goods and services in the country, with the resultant contribution to the development of highly diversified sources of production and payment of Argentine labor.

In order to attain the prime goal of producing 500 kilograms of 20 percent enriched uranium, which is the amount estimated as necessary to supply our experimental reactors and the potential Latin American market, an investment similar to the one already made will be required. The expansion of this plant for 1 percent enrichment of 170 tons of uranium to power the generation from our nuclear powerplants will demand a doubling of these investments.

It is important to emphasize that, in addition to the value of the results accrued in the nuclear field, the nation has been enhanced with valuable new kinds of technology which had to be developed concurrently to solve the various complex problems that had to be surmounted, such as those associated with the production and application of halogens, nickeling techniques, production of sulphur hexafluoride, that of super-lubricating oils, etc., which have major applications in a wide variety of fields in the national industry, and which afford obvious opportunities for non-conventional exports. If anything, this reinforces the many benefits from the investment made, and confirms the proliferating value of every peso used for research and development activities. This compounds the economic advantages cited in previous points.

Selection of the Method Used

In 1978, when it was decided to undertake the project, an analysis was made to determine the method most accessible to our industrial scientific and technological capacity.

At that time, the only method in commercial operation in the world was that of gaseous diffusion, used by both the United States and the Soviet Union. And it is the one that has produced the fuel used to date by all the enriched uranium powerplants operating in the world.

France, which has the electric nuclear program with the greatest relative growth in the West, had a large production plant using gaseous diffusion in an advanced state of construction.

And the tripartite consortium, made up of Great Britain, the Netherlands and the Federal Republic of Germany, had a first plant using the ultracentrifuge method.

When the types of technology involved in both methods had been evaluated, and considering that the time factor was essential and that the manufacture of the ultracentrifuges with the special features required was beyond the reach of the native industry at the time, the decision was inclined toward the gaseous diffusion method.

The fact that this was a recent development, based on a completely effective process, and the additional capacity to introduce technological innovations into it had been acquired, has discredited the arguments about its alleged obsolescence.

With regard to the unit cost of enrichment with the method adopted, it is worthwhile pointing out that there is nothing more expensive than what one does not have. But, furthermore, the cost factor is relevant only when it relates to the large production plants used to supply scores of enriched uranium and light water nuclear powerplants; which entails producing thousands of tons of uranium, with an enrichment of from 3 to 4 percent, owing to its effect on the cost of generating electricity.

On the other hand, the cost of producing radioisotopes is almost impervious to the slight differences in cost stemming from the enriched uranium production method, and hence lacks significance in comparison with the autonomy that has been achieved in this area. For the application thereof in our nuclear powerplants, we are confident of attaining production costs that will make it possible to accrue the anticipated benefits.

Final Comment

When, without outside assistance, we undertook the technological development of uranium enrichment, we realized the magnitude of the problem to be solved,

revealed by the fact that the mastery of that technology is what divides the countries which establish policies in the nuclear field from those which are forced to comply with them. It is a technology that the vast majority of countries, including Argentina up until 1978, considered completely out of reach, because of its obvious technological difficulties. To have surmounted them in 5 years, and with a small investment, means that this success must be categorized as the most important, significant development achieved in Argentina. This has been a result of a scientific and technical policy executed by the CNEA constantly for over 30 years, managing to create the technological schedule essential for undertaking vanguard development and innovation in the nuclear field. It has also been a result of how the INVAP S.E. [Applied Research Institute, Inc] company was conceived: a technology company created by the National Commission for Atomic Energy and Rio Negro Province, which was responsible for the successful execution of the project.

This execution is an example of how groups of scientists and technicians from many different disciplines should be formed, directed and coordinated, in order to succeed in the difficult task of producing technology.

In conclusion, we might summarize the benefits that this development has offered to the country, as follows:

1. The country has attained mastery of one of the most "sensitive" types of technology. This has lent us an international presence that will reinforce our action to attain the national goals in both the nuclear and non-nuclear fields.

2. In the Latin American area, not only have we reached the level of a complete supplier, but we have also proven that we have great scientific and technical reliability, solidly backing our aspirations as exporters; because we have quickly and efficiently provided a solution to a problem that only very advanced countries manage to accomplish.

3. It has given us the autonomy to operate our research and teaching irradiation reactors so as to ensure the local supply and export of radioisotopes and the training of human resources in nuclear engineering on the highest level.

4. It has afforded us the opportunity to cut the cost of nuclear electric generation and the uranium consumption for producing a given energy.

5. It has offered us the chance to reuse the fuel elements already irradiated at Atucha I (there are now over 2,500), and has expanded the nuclear powerplants' storage capacity for those elements.

6. We have been enhanced by valuable new types of technology offering obvious opportunities for unconventional exports, with a high degree of value added.

7. It has given us the freedom to undertake, with our own resources, the construction of a reactor for testing fuel elements and materials for nuclear use; which has enabled us to remain in the vanguard of a technology that is constantly evolving.

8. We have helped to demonstrate that the negative policy encouraged internationally by the great powers is not only annoying, because of its discriminatory nature, but is also inefficient.

Without having exhausted the topic, I think that I have provided an overall, though summarized view of the most significant features of this all-important national development.

2909
CSO: 5100/2104

MEMORANDUM SIGNED WITH PRC ON NUCLEAR MATTERS

FY310335 Sao Paulo FOLHA DE SAO PAULO in Portuguese 30 May 84 p 7

[Text] Brazil and the PRC yesterday signed a memorandum of understanding on cooperation in the nuclear energy field. The document was signed by Brazilian and PRC Foreign Ministers Ramiro Saraiva Guerreiro and Wu Xueqian, in the presence of Presidents Figueiredo and Li Xiannian. The memorandum, the first of the type signed by the PRC with a Third World country, will facilitate in the future the establishment of an agreement with the same objective with other countries facing problems in the supply of energy for their development.

According to members of the presidential delegation, the importance of this document lies in the fact that the two countries "seek an autonomous training" in mastering nuclear technology "for peaceful ends," a technology currently controlled by the great powers. Brazil and the PRC are not signatories of the Nuclear Nonproliferation Treaty.

The document specifies that the areas of cooperation will probably include basic research on the peaceful uses of nuclear energy; technology relative to research, planning, construction, and operations of nuclear plants and research reactors; technology for the prospecting and reprocessing of uranium; production of fuel elements; regulation and research for nuclear security; and production and the use of radioisotopes in areas of mutual interest. According to the terms of the memorandum of understanding, the two countries will exchange knowledge and information in the nuclear field, which will open the door in the future for an exchange of technologies.

Saraiva Guerreiro signed other agreements as well with the president of the State Science and Technology Commssion. Among these is a multisector supplementary adjustment to the Scientific and Technological Cooperation Accord which was put into effect only 2 months ago, although it was signed in 1982. In this agreement the two countries agreed to intensify their cooperation in the areas of agriculture, livestock, fish culture, silviculture, health, electricity, microelectronics and computers, space, and standardization. It will be up to the Brazilian-PRC Joint Commission for Scientific and Technological Cooperation to establish concrete projects of cooperation in specific areas. Moreover, a supplementary protocol to the trade agreement between the two countries was also signed.

Brazil and the PRC will in August 1984 complete 10 years of the resumption of diplomatic and commercial relations, severed by Brasilia after the March 1964 movement.

Regarding bilateral talks with Beijing, Brazil intends to even the trade balance between the two countries which last year presented an unfavorable balance to Brazil of $223 million.

Among the matters discussed by Brazilian and PRC economic authorities was a transport agreement. Under this agreement, Brazilian ships will carry iron ore to the PRC and will return with petroleum and coal. The Brazilian Government has decided to offer planning and equipment for the construction of the Tiansehengqiao hydro-electric dam in exchange for the supply of PRC petroleum. Moreover, the formation of a binational enterprise was announced in Beijing for the exploitation of wood in Manaus, while the creation of another enterprise for the extraction of iron from the Timbopaba mine is under study.

CSO: 5100/2106

CCHEN PRESIDENT ON NUCLEAR PROGRAM, POLICY

PY120130 Santiago LA TERCERA DE LA HORA in Spanish 6 May 84 p 1

[Interview with Hernan Brady, minister president of the National Energy Commission and the Chilean Nuclear Energy Commission, CCHEN, by an unidentified reporter; place and date not given]

[Excerpts] [Reporter] In simple words, what purposes has the CCHEN served?

[Brady] I would say that it has served to increase Chile's capacity to carry out scientific and technical research studies. The CCHEN has not only contributed to developing the medical and agricultural sectors, but it has also attained the capacity for research studies and the technological level required to promote regional development. It must be understood that nuclear energy is not only used to produce belligerent weapons but more basically to promote national development. We use nuclear energy for medical purposes, such as producing radioisotopes to treat cancer and a number of other illnesses, sterilize surgical equipment, and for a number of other activities in which radioisotopes are used rather intensively. In the agricultural sector, nuclear energy helps to control pests, preserve food, select and improve the quality of seeds, and other uses. In the mining sector, nuclear energy is used to control flux and a number of other elements which facilitate the exploration and investigation of resources by reducing expenses and increasing effectiveness. In the industrial field, nuclear energy is used for many things, such as measuring fluids and finding faults or leaks in specific materials. This helps to save time and to increase costs [as published].

[Reporter] Based on what we have been saying, could we say that Chile uses nuclear energy exclusively for peaceful purposes?

[Brady] Absolutely. We are certainly only using nuclear energy for peaceful purposes. Chile wants, and it has said this at all international forums, to preserve the Latin American Continent free from nuclear weapons. This is the government's policy, which I believe all the people support.

[Reporter] Is Chile concerned over the attitudes of countries that have not signed the Tlaltelolco Treaty which prohibits atomic weapons in Latin America?

[Brady] Yes, it concerns us, of course, because we believe that the Tlaltelolco Treaty is a regional agreement that guarantees security through the

prohibition of nuclear weapons without the restrictions of the Nuclear Arms Nonproliferation Treaty. We have signed the Tlaltelolco Treaty and we will ratify it without reservations after all the Latin American countries have signed it.

[Reporter] Do you think that the expenses incurred by the CCHEN over the past 20 years are justified? Would it not have been better to use that money for other things?

[Brady] No. I think that the expenses are totally justified. Producing just radioisotopes for the medical, agricultural, and mining fields totally justifies the expenditure.

[Reporter] Do you think that in the nuclear field Chile has made considerable progress compared to other nations?

[Brady] Yes. In Latin America we reportedly occupy the fourth place after Argentina, Brazil and Mexico.

[Reporter] Why was the Latin American meeting on public approval of nuclear energy held? Are there any problems in this field?

[Brady] You must not forget that unfortunately the nuclear bomb was created to destroy Hiroshima and Nagasaki. The people who do not understand nuclear energy and how it is used immediately think of an atomic bomb when nuclear energy is mentioned. In other words, there is a natural rejection. The purpose of the meeting was to analyze the measures that must be adopted at a regional level to familiarize the people with what nuclear energy and how it can help to attain development. An important conclusion was that the people must have more information about nuclear energy. Chile has provided quite an interesting experience in this field through lectures to youths, conferences, books and publications on nuclear energy. Other countries conveyed various other experiences. It was agreed appropriate to disseminate more information about nuclear energy in order to make the people, particularly youths, aware of the truth about nuclear energy and its benefits.

CSO: 5100/2100

COMMUNIST PAPER SCORES U.S.-PRC NUCLEAR AGREEMENT

New Delhi PATRIOT in English 30 Apr 84 p 4

[Editorial]

[Text]

After a whole school of red herrings, the truth is out. It is not trade or cultural relations, not the prospect of a Chinese cosmonaut soaring into space in American company, not the preservation of the panda; none of this is related to the main significance of the Ronald Reagan's mission to Beijing. Kept a precious secret till its dramatic announcement, the Sino-US agreement on nuclear cooperation demonstrates for the blind to see the added dimensions of an utterly unprincipled political military axis.

The features of the agreement, which exhibit the very special nature of the Washington-Beijing strategic alliance, will not be missed, especially in India. The sticklers for the alleged norms of 'nuclear non-proliferation', who made a near intractable issue of fuel for this country's Tarapore nuclear plant, have been deterred by no similar considerations vis-a-vis their neo-maoist comrades-in-arms. It has been given out that differences over a US law requiring American consent for the reprocessing of spent fuel have been resolved, though it has not been specified how. There is no indication either that the "guarantees and controls", which the agreement spells out, in any way ensure employment of China's strengthened nuclear muscles purely for peaceful purposes. All that becomes clear is the staggering magnitude of the danger this stepped-up politic-strategic cooperation poses to regional and world peace, enabling as it does the supply to China of a dozen big US nuclear reactors with a 20,000 megawatt total capacity. The meaning of this "breakthrough" is only undercovered by the promised imminence of another first in the Sino-US transactions; the sale of American "defensive" weapons to the expansionists of the Middle Kingdom.

The threat this represents to the region is heightened in view of Washington's continued efforts to firm up militarily the phoney 'frontline state' of Zia-ul-Haq's Pakistan, aided and abetted by mandarian diplomacy. The galaxy of American and Chinese luminaries, who have followed each other in recent months to Islamabad, have helped to keep the intents of the axis in this regard a dark secret. The Indian apologists for the axis are fooling nobody when they try to make out that Beijing persists in seeking full normalization with India

through such contacts as an odd trade union delegation or an unimportant Subramaniam Swamy. Nor can they, so late in the day, convincingly differentiate between the regional and international policies of Beijing and pretend that the one pursues peace though the other may promote war. They cannot expect people to draw comfort from the report that Chinese Premier Zhao Ziyang has expressed the hope that the US would halt deployment of medium-range nuclear missiles in Europe, for he has also been quoted as voicing concern at alleged increase of "nuclear missiles deployed in Asia by the Soviet Union". That would sound like a plea for a more active US role in Asia, and, that brings the danger the nuclear accord embodies all the nearer home. China-US nuclear axis and the further firming up of military alliance between Washington and Beijing have immediate and serious implications for the security of India, specially when these developments are seen in the context of China's supply of aircraft and submarines to Bangladesh, nuclear designs and facilities to Pakistan and its persistent policy of inciting the neighbours against this country.

CSO: 5150/0010

IMPORTANCE OF NUCLEAR POWER TO INDIA EMPHASIZED

New Delhi PATRIOT in English 9 May 84 p 4

[Editorial]

[Text]

Dr Raja Ramanna, Chairman of the Atomic Energy Commission, has confirmed the probability of an accord on a Soviet-supplied nuclear power plant for this country. If the proposal goes through, the new atomic power house will eventually have an installed capacity of 1000 MW and may well be an important element in the Atomic Energy Commission's plans for generating 10,000 MW by the end of the century. Clearly, this proposition will have to mesh with the overall plans for nuclear energy to be generated in the remaining years of this century. It is to be hoped that, remembering the energy famine which looms over India, the matter will be given early attention by the governments of the two countries and decision taken bearing in mind all related factors. While the terms of the sale of the plant are a relatively easy matter to sort out, particular care has to be taken of the choice of the fuel for the power reactor the USSR has offered. According to Dr Ramanna, the Soviet plant will have enriched uranium for its fuel. India's own programme has opted for natural uranium and heavy water. Assured supply of enriched uranium is a matter of utmost importance for the success of the project under discussion. The safeguards under which the Soviet Union will agree to supply enriched uranium will presumably be those that are applicable to the Tarapur atomic power plant. Since India has accepted IAEA inspection for Tarapur the matter of safeguard may not be a serious problem for importing a power plant from the Soviet Union.

But current attention in this country focuses not so much on the Soviet offer as on the campaign being waged against India's plans for nuclear energy and development of related technology. There are, to be sure, many failures and deficiencies in India's nuclear power programmes, and it is not necessary to understate or find excuses for them. At the same time, it is important to emphasise that the attacks being made on India's plans have a subversive purpose. What is being attempted is not rectification of the deficiencies but wholesale denigration of the plans for nuclear power as one of the new energy sources for the country.

Nuclear power generation rests on new technology and not even the great industrial giants of the world have overcome

all difficulties they encounter in harnessing atomic energy for civilian uses. In this country these problems have multiplied through bureaucratic mishandling and the failure to provide firm leadership to the atomic establishment which has been weakened by temperamental differences among its leading scientists. But critics do not really want to remove these weaknesses, however much they may exploit these deficiencies as their talking points. They are, in fact, trying to demolish the assumption that India, caught in an energy crisis which is deepening every year, must turn to non-conventional energy sources of which atomic power is better known and most promising. With a vast and growing population and abysmally low per capita energy availability, India has neither hydrocarbons nor coal on the scale required by the country's increasing demand for energy. But some Indians have swallowed the Western line according to which India should not be turning to nuclear power for bridging her energy deficiency. The United States, whose profligate consumption of fossil fuel has recklessly depleted conventional sources and contributed to the global energy crisis, now disapproves of the efforts developing countries make to tap nuclear energy. The objections are many but the one about nonproliferation and safety dominates the case against nuclear power plants in the poor countries. While atomic power houses are safe in the hands of those who are daily adding to their overkill capabilities, the poor nations are apparently not to be trusted with nuclear power houses. But this is technological colonialism which India will not accept.

CSO: 5150/0013

AEC CHIEF SAYS INDIA CAN BUILD ITS OWN REACTORS

New Delhi PATRIOT in English 28 Apr 84 p 6

[Text]

Calcutta, April 27 (PTI)—India has reached a stage when she can build her own nuclear reactors and take care of some of the older reactors. Atomic Energy Commission Chairman Dr Raja Ramanna said here today.

Delivering the convocation address at the 19th annual convocation of the Indian Institute of Management, Calcutta, Dr Ramanna referred to the reactors of Rajasthan (Phase II) and Madras (Phase I) and said the nuclear scientists of the country could also produce heavy water, one of the important components of the nuclear industry.

He regretted that for some reason, it was being said that heavy water was not being produced in this country. "All these statements are false. Instead of appreciating the fact that we have achieved something, there is a big force in the country which will not even allow the appreciation of the advance made here," Dr Ramanna added.

The country's atomic energy programme, he said, had made more headway from the point of view of self-sufficiency than any other industry bearing in mind the special impact it had in its economic and technological growth. Nuclear industry was a highly competitive field with a high rate of obsolescence involving a heavy capital investment, the nuclear scientist added.

Dr Ramanna, who is also principal secretary of the Department of Atomic Energy, said cricumstances had forced the Commission to a situation when most of the components required for the programme could not be imported. Atomic energy was mainly devoted to the generation of nuclear power. This meant sustained fuel development of very sophisticated design, associated machinery and development of new reactor designs and associated materials of construction. Atomic energy included utilisation of the other peaceful uses of the atom in industry, agriculture and medicine through the use of radiation using isotopes, he added.

Stating that the most important component in any venture of this type was acquisition of the right type of people and right atmosphere for them to remain productive and original, Dr Ramanna said India had achieved this through the Bhabha Atomic Research Centre (B.A.R.C.) and the training division. The B.A.R.C. was almost like the sun around which the entire nuclear programme ran. It developed all the new fuels, the new computer codes, new materials for the construction and those having important fall-outs in fields other than atomic energy, like the production of beryllium metals.

He said the power porgramme was a very large one and financially, it was the largest enterprise within the organisation. While the power programme depended on standardisation, its maintenance and competitive position in the rest of the world pivotted around the research organisations like the B.A.R.C., reactor research centre at Kalpakkam and the new centre, which was to come up at Indore.

The Atomic Energy Commission proposes to set up a number of special centres in various universities in the country to carry on the expansion work of the atomic energy programme, according to Dr Ramanna.

Dr Ramanna was of the view that brain-drain was taking place as the foreign countries accorded highest priority to merit and originality of a scientist. That was why, he said, these countries attracted all the good people and, as a result, these countries were making progress.

At one stage, Dr Ramanna said, it used to be said that exodus from the land of birth was for making money. But if one was in a position to appreciate constantly the need for giving recognition to merit and originality, one would not leave the country, Dr Ramanna added.

About one 100 post -graduates, including seven girls, received degrees from Mr A L Dias, chairman of the Institute's board of governors. Dr Ramanna distributed prizes to seven recipients.

CSO: 5150/0008

NUCLEAR RESEARCH CENTER DIRECTOR ON FUTURE PLANS

Bombay THE TIMES OF INDIA in English 15 Apr 84 p 3

[Text] BOMBAY, April 14--The Bhabha Atomic Research Centre here is geared to meet the technological challenges posed by the proposed 500 MW nuclear power plants in the country.

Delivering a lecture at the Nehru Planetarium here yesterday, Dr. P. K. Iyengar, director of the BARC, said the 100 MW research reactor "Dhruva" to be commissioned at Trombay in the next three months would provide the facility for testing uranium fuel bundles for 500 MW reactors.

Dr. Iyengar mentioned that by 2000 AD, the projected nuclear energy production in the country was 10,000 MW, which meant building of additional 12 units of 235 MW and 10 units of 500 MW, calling for a total capital outlay of over Rs. 8,000 crores.

Dr. Iyengar showed a rare slide of the mixed oxide fuel (MOX) pilot plant at BARC. The much maligned plant, though not useful for the Tarapur plant now, would be utilised in fabricating fuel for fast breeder reactors.

The futuristic programmes of the BARC include new areas in basic research leading towards nuclear fusion, high power lasers and their use in a number of fundamental and applied areas, capability for the wider use of computers and microprocessors, development of new technologies like superconducting materials and magnets, and design and construction of high energy accelerators.

Automation of process control in the spent fuel reprocessing and use of laser chopping the highly radioactive spent fuel rods from power reactors were also being planned.

Commissioning of the Rs. 50-crore "Dhruva" would mean abundant production of radioisotopes leading to their extensive use in medicine, industry and research.

According to Dr. Iyengar, irradiated potato and onion, based on the BARC technology, were yet to be allowed for human consumption in India. It is learnt the government approval for permitting its consumption would be given very shortly.

CSO: 5150/0001

NUCLEAR POWER PLANTS SAID IN 'APPALLING STATE'

Delhi INDIAN EXPRESS in English 9 May 84 p 6

[Editorial: "The Nuclear Mess"]

[Text] The appalling state of affairs in India's heavy water plants and nuclear power plants has not been explained satisfactorily at all by Dr Raja Ramanna and his colleagues in the nuclear establishment. A series of articles in *THE TIMES OF INDIA* has made the most serious charges about the rot in the nuclear establishment, replete with figures taken from documents of the Department of Atomic Energy. These need the most detailed answers, which in turn must be the subject of cross-examination. Is it true that although Rs 400 crore have been sunk in four heavy water plants, their actual output totalled only Rs 4.45 crore in 1982-83 and Rs 4 crore in 1984-85? Is it true that despite the poor performance of all plants so far, new ones are being put up on the assumption that faithful copies can be made of the existing ones in the absence of a qualified design engineering cell? Is it true that the cost of production of heavy water at the projected Thal plant will be Rs 10,000 a kilo and at Manuguru Rs 15,000 per kilo? Is it a fact that heavy water costs alone will add one rupee to the unit cost of generating nuclear power? And if so, how can nuclear power based on this technology ever be economically viable? Is it true that the guarantee period for the Talcher heavy water plant is likely to expire before it is even commissioned properly? Is it true that the design failures at Talcher are so serious that it is unlikely ever to be viable? Is is a fact that the plants at Baroda and Tuticorin have never produced more than 30 per cent of their rated capacity?

At a press conference, Dr N. Srinivasan, director of Heavy Water Projects, made certain bland statements which call for much deeper scrutiny. He declared that the Talcher project was quite viable and that the engineering problems were not difficult to solve. How can he know that the plant is viable if it has never operated on a sustained basis? Knowing the problems that have plagued heavy water plants for years — the Kota plant being a classic example — what is the basis for saying that Talcher will not be similarly afflicted? Dr Srinivasan claims that the Tuticorin plant is a success and has been working at 80 per cent of capacity. How is this to be reconciled with figures taken from DAE documents showing that Baroda and Tuticorin operated at less than 30 per cent capacity between November 1983 and January 1984? If Tuticorin has merely worked at 80 per cent capacity for a few weeks or months, that is meaningless. What is relevant is its performance on a sustained basis. It is certainly to be hoped that nuclear scientists will overcome problems that have arisen. But what is the use of pretending thaj the nuclear programme has been a great success when failure is writ large over several areas where no secret documents are needed to establish failure? It is a known fact that heavy water plants whose construction started a dozen years ago or more have produced virtually nothing. It is well known that final costs of nuclear power stations as well as heavy water plants have been thrice as much as the original estimates.

Dr Ramanna and his colleagues feel that they have achieved a great deal in the face of a series of unanticipated problems. They argue that the cost of learning is high, and the very fact that India has the capacity to build sophisticated nuclear plants by itself is a great scientific achievement. But it remains to be demonstrated that it is a great commercial achievement. Nuclear power stations and heavy plants are supposed to be commercial propositions, not laboratory experiments. Nuclear facts have been hidden for far too long from the public gaze in the name of secrecy. It is essential for the Department of Atomic Energy to come out with a full performance budget, laying down targets and cost estimates year by year for every plant, and then stating the actual performance. Its balance sheet must also be published. It should then be left to the public to decide whether the plants have performed well. The nuclear establishment cannot be the sole judge of its own performance in the name of secrecy.

CSO: 5100/4724

PANEL RECOMMENDS COMPREHENSIVE NUCLEAR POWER POLICY

New Delhi PATRIOT in English 26 Apr 84 p 5

[Text] The Estimates Committee has recommended formulation of a comprehensive national policy on atomic power to meet the "evergrowing" power shortage in the country, reports UNI.

The committee, in its 82nd report presented to Parliament on Wednesday said although the capital cost of nuclear power plants was estimated to be 25 per cent more than those of thermal plants, the overall cost of respect of nuclear energy 'its quite less'. Therefore, the committee saw no reason why the country should not tap all sources of atomic energy 'in a big way' to solve its power needs, the report said.

The committee has said even though the country was producing 30 times more nuclear power than Pakistan, in terms of percentage, electricity generated from nuclear power was less than half of what it was in Pakistan. In this connection the committee recalled the claim made by eminent scientist Dr Homi Bhabha that 70 per cent of the power requirements of India could be met by atomic energy if these were harnessed and developed.

Although the atomic energy commission had envisaged in 1968 commissioning of 2700 mw of nuclear power capacity by the end of 1980, so far only a capcity of 869 mw had been established, it said.

On the Tarapur atomic power plant the committee said it could well imagine the extent the plant had suffered a setback because of the failure of some foreign countries to keep up the uninterrupted supply of enriched uranium.

The committee recommended that the existing machinery for coordination should be strengthened to ensure uninhibited planning and execution of as well as generation of electricity from nuclear power projects.

Regarding the Rajasthan Atomic Power Plant the committe has recommended that the Prasad Committee's recommendations relating to the organisational weakness of the plant might be processed and conclusive action taken without loss of time.

The implementation of atomic power projects should be streamlined and modern techniques of management ensured to complete and commission such projects, in time, it said.

The committee also suggested that the feasibility and the advisibility of setting up an integrated power grid for the entire country might be examined in consultation with the State Governments. It has welcomed the approach of the Government to put up the nuclear power plants in the eastern region.

The committee said cent per cent indigenisation of the power plant was not only desirable but was also achievable.

The committee said if the constraints of the heavy water plants at Tuticorin and Baroda are really found "irremediable" augmenting of the available capacity for production of heavy water should be considered forthwith.

CSO: 5150/0003

DEVELOPMENTS SURROUNDING URANIUM THEFTS REPORTED

Arrest in Varanasi

Calcutta THE TELEGRAPH in English 16 Apr 84 p 1

[Text]

Varanasi, April 15 (PTI): The Ghazipur police yesterday arrested one Mohammed Zakir and recovered 250 grams of uranium from his possession, according to reports received by the deputy inspector-general of police, Mr B.S. Bedi, here today.

Mr Bedi said the material packed in a polythene bag looked like uranium and Zakir confessed that it was uranium valued at about Rs 1 lakh. Zakir also said it was passed on from Ranchi to someone in Varanasi. He said he had received Rs 20,000 for delivering the packet. The material was handed over to him by the son of a security officer of Ranchi, he said.

Mr Bedi said arrangements were being made for getting the material examined by BARC (Bombay) and Banaras Hindu University.

Meanwhile, Zakir has been remanded to police custody for seven days and a police officer has gone to Ranchi for further investigations.

More Arrests Reported

Madras THE HINDU in English 23 Apr 84 p 6

[Text]

GHAZIPUR, April 22.

Police have arrested two more people from Tatanagar in connection with the recovery of 250 grams of uranium from Mohammed Zakir here on April 13.

The two, namely Tapan Kumar Gosh and Shantnu Biswas, were alleged to have passed on the uranium to Zakir for sale.

On interrogation of Zakir, the police recovered 50 grams more of uranium buried near the Lanka locality.

An international gang of uranium smugglers, involving some employees of the TISCO factory of Tatanagar, was busted in 1978 when 1,100 grams of uranium was recovered while being smuggled out of the country. Ten persons were challened in that connection.

Hoax Suspected

Calcutta THE TELEGRAPH in English 18 Apr 84 p 1

[Article by Uttam Sengupta]

[Text] **Ranchi, April 17:** The police here suspects that cases of "uranium smuggling" in the area are the handiwork of a gang passing off sodium nitrate or synthetics as uranium.

Senior police officers pleaded ignorance about newspaper reports that a man, arrested in Varanasi with contrabrand uranium, had claimed that the son of a security officer in Ranchi had given him the consignment.

However, they said, several samples of "suspected uranium" had been seized by the Ranchi police recently, but, on being tested at the Uranium Corporation of India at Januguda, these samples had proved to be anything but uranium. In each case, the persons from whom the samples were seized confessed that it was uranium but subsequent tests had always revealed otherwise.

The senior superintendent of police, Mr Vineet Kumar Joshi, told **The Telegraph** that while the couriers undoubtedly believed that they were carrying uranium, the scarce and expensive mineral simply cannot be carried around so casually. In one case, the substance was wrapped in a piece of cloth. In yet another case, the substance was found sealed in a plastic bag on which was printed: "Uranium State USA, Highly Explosive." Mr Joshi said the printing was obviously done in India itself. He ruled out the possibility of uranium smuggling, pointing out that the mineral was radioactive and it did not have a ready market either.

According to the police, in each case of alleged uranium smugglers being nabbed here, the police had acted on the information that the persons were carrying unlicensed arms. It was only in course of searches that samples of the substance were found, and on being asked to identify the substance, the arrested persons had said that it was uranium.

The Uranium Corporation of India has firmly discounted the possibility of uranium being smuggled out of the Jaduguda mine. But nevertheless, no CBI enquiry has been ordered so far into the charges, as proposed by the police itself around two years ago.

Till Tuesday afternoon, the Varanasi police had not got in touch with the police here regarding last week's arrest of a person claiming a Ranchi connection

CSO: 5150/0002

BRIEFS

INDIA TO TRAIN EGYPTIAN PERSONNEL--India is to train Egyptian personnel in the peaceful use of atomic energy. The first batch of Egyptian trainees will arrive in India later this month. The two sides have reached an agreement on cooperation in this field. After the training, the Egyptians will work at atomic power plants being set up in Egypt. [Text] [BK131251 Delhi Domestic Service in English 1230 GMT 13 May 84]

NARORA PROJECT COSTS--The cost of the Narora Atomic Power Project (NAPP) has increased by about Rs 190 crores from the original estimates, Prime Minister Indira Gandhi informed the Rajya Sabha on Thursday, reports UNI. The revised estimate of the project is Rs 400 crore as against the original estimate of Rs 210 crore, Mrs Gandhi said in a written answer. The first and the second unit of NAPP are scheduled for completion by 1987-88 and 1988-89 respectively. Mrs Gandhi said the second unit of Madras Atomic Power Project (MAPP) is scheduled to be completed in 1984-85. The revised cost of the second unit of MAPP was Rs 127 crore as compared to the original estimate of Rs 70 crore. Answering another question, Minister of State for Atomic Energy Shivraj Patil said the second unit of Tarapur Atomic Power station was under refuelling outage and the first unit was in operation. [Text] [New Delhi PATRIOT in English 27 Apr 84 p 5]

NUCLEAR WASTE PLANT--BOMBAY, May 2--The country's nuclear power programme has taken a giant leap in ensuring total safety to the environment with the setting up of the first nuclear waste disposal plant at the Tarapur atomic power complex. The Director of the Bhabha Atomic Research Centre (BARC) here, Dr. P. K. Iyengar, said the entire plant known as "the nuclar waste immobilisation plant" had been developed indigenously. A second plant would be set up in BARC by the year end. [Text] [Madras THE HINDU in English 3 May 84 p 7]

CSO: 5150/0005

ZIA STATES COUNTRY'S CASE FOR NUCLEAR ENERGY

PM311519 Jidda 'UKAZ in Arabic 28 May 84 p 6

[Excerpt]

['Abd as-Sattar] What is Pakistan's real problem as far as the manufacture of an atomic bomb is concerned? How far have you gone towards completing this project?

[Ziaul Haq] As a developing state we feel that it is very important for us to diversify the sources of energy to meet the country's needs and requirements. We have been trying for years to have a project for the production of atomic energy for peaceful purposes. As you know, Pakistan is a big and vast country and there is no end to its energy needs.

When we began our quest for atomic energy we tried to explain to the world the uses for which we wanted that energy. We pointed out that Pakistan was not interested in producing atomic energy for war purposes, but unfortunately some people still believe that we wanted atomic energy for warlike activities, not because it has other uses and is important for defense. Pakistan now has uranium and is in fact self-sufficient in it. The cycle for the production of the nuclear bomb is now complete here, thank God. We are proceeding with our project for the manufacture of nuclear and atomic bombs. We have an energy plant in Karachi. It originally came from Canada in 1962. So we have actually been in the process of producing atomic energy for 20 years.

The problem is basically that the United States, because of its relations with Israel and Pakistan's relations with the Arab states, is worried about this project. It is afraid that Pakistan might provide such Arab states as Saudi Arabia, Kuwait, the UAE, and Qatar with atomic energy and thus enable them to destroy Israel and throw the Israelis into the sea. Furthermore, Pakistan is an Islamic state, and the United St[illegible] and its allies do not want to see a strong Islamic state capable of making its own decisions. They want the Islamic states to be in a permanent state of disagreement and to be at their mercy. We told the United States and the European states that Pakistan's manufacture of nuclear bombs is for peaceful purposes. [as published] Furthermore, nuclear energy program observers have already come to Pakistan and seen all our equipment and machinery and found them to be in harmony with international regulations and specifications with every step taken strictly within this framework. With God's help we shall proceed with the production of the atomic bomb, because we really need other sources of energy for peaceful purposes. [as published]

CSO: 5100/4726

SCIENTISTS ELABORATES ON DEVELOPMENT PROGRAM

GF141344 Karachi DAWN in English 11 May 84 p 17

[Report on meeting with Pakistani nuclear scientists Dr Abdul Qadeer Khan by Brigadier A. R. Siddiqui in Islamabad--date not given]

[Excerpts] [Passage omitted on scientists's personal attributes] Question one pertained to his unambiguous pronouncement in a press interview that his outfit (Dr A. G. Khan's research laboratories, Kahuta) could give Pakistan the bomb, if ever a political decision was taken to that effect. His answer was simply this: "It was hypothetical answer to a hypothetical question." My second on-the-record question about the compulsion and the necessity for him to talk to the press at all, brought a longer and more spirited answer. To call a brilliant Western-educated and trained world recognized scientists a nuclear spy and a thief would be the height of injustice and narrow-mindedness. It hurt Dr Qadeer as deeply as it did his countrymen and assuredly a large number of his colleagues and fellow researchers at the Technical University at Charlottenberg (Dusseldorf, West Germany), the Technoloigcal University of Delft (Holland) and the University of Leuven in Belgium--all world-renowned seats of learning. He obtained his doctrate of engineering in physical metallurgy from the University of Leuven in 1972.

The conviction of Dr Qadeer by a district court in Amsterdam on 14 November 1983 and the award of a 4-year prison term to him in absentia forced the self-effacing Pakistani scientist to break cover and expose himself to the national press "to put the record straight."

It is noteworthy that as far back as 1979, the Dutch Government had appointed a parliamentary investigation committee to look into the allegation that Dr Qadeer might have taken classified material without proper authorisation. In Holland, Dr Qadeer had been associated with the centrifuge development work from 1972 to 1976. He left Holland earlier in 1976 and has not revisited it since.

In early 1980, however, the parliamentary committee "explicitly" exonerated the Pakistani scientist from all charges of spying or "obtaining classified information or putting this information at the disposal of any third party."

Some of the academic distinctions earned by Dr Qadeer during his working career in Holland included the publication of some 20 papers and the editing of a most

authoritative work on the subject entitled "Topic in Physical Metallurgy": The edited version was published by Elsevier Amsterdam in 1972.

Now a few words about Pakistan's uranium enrichment programme and capability. [passage omitted]

The two well-known methods are the diffusion method and the centrifuge method. Diffusion method has been used by the United States, USSR, England, France and China to obtain weapon grade material. The centrifuge is the latest and a relatively more economical method. It is now well established and recognised and though plants producing reactor grade material (3 to 3.5 percent enriched) are openly operational, there is no information of the technology being used for weapon-grade material (about 90 percent enriched) by any country.

It would be therefore hardly correct or fair to assume that Pakistan either has the capability or the intention to produce a bomb right away. All that has happened is that is has acquired a scientific technique supposed to have been beyond the ken of a developing country like Pakistan. Given the engineering and the technical wherewithal, there is little doubt, it can catch up with India and other countries like South Africa and Israel.

Pakistan does, however, suffer from the lack of certain infrastructural facilities to prevent it from going nuclear in one single leap. Dr F. Hassan Ph.D (London) has, in a lengthy and detailed presentation indentified the following facilities we must have before going nuclear:

(i) A production reactor (i.e. a reactor capable of producing plutonium), (ii) a fuel fabrication plant; (iii) a heavy water production plant and (iv) a reprocessing plant.

Above all, says Dr Hassan, all these facilities must be outside the International Atomic Energy Commission (IAEA) safeguards. A closer look at Pakistan's nuclear programme would reveal that we do not have a plutonium production plant at all, our fuel element production capability is minimal, we did not have a heavy water facility to replensih the loss of heavy water in Kanupp [Karachi Nuclear Power Plant] and finally after the unilateral abrogation by France of the reprocessing deal we are left high and dry. And the facilities at New Lab near Pinstech (Pakistan Institute of Technology] are trivial.

From a purely theoretical and academic point of view, however, says Dr A. G. Khan we are capable of enrichment to 3 percent (i.e. reactor grade) there is nothing that stands in our way technically to stop us from enriching up to 90 percent (i.e. weapon-grade).

"It is this possibility and capability," writes Dr Qadeer in an article about to be published, "that has sent jitters to India and a number of Western countries."

He adds: "Both our president and I have categorically stated that our enrichment programme is solely for peaceful purposes and we do not have any intention to make nuclear weapons." [passage omitted]

LEADING SCIENTIST DISCUSSES URANIUM ENRICHMENT CAPABILITY

GF251106 Dubayy KHALEEJ TIMES in English 25 May 84 p 5

[Report from our correspondent]

[Text] Islamabad--Pakistan's leading nuclear scientist Dr Abdul Qadir Khan, has said that having mastered the crucial enrichment technology, "it is theoretically" possible for us not only to manufacture atomic bombs but also hydrogen bombs for which only enrich uranium bomb is used for a trigger.

However, he emphatically repeated that Pakistan's enrichment programme was purely for peaceful purposes and was meant to meet the country's energy requirements in the coming years.

Writing in the latest issue of the monthly DEFENSE JOURNAL of Karachi, Dr Khan contested the statement of Indian nuclear scientist Dr Homi Sethna that India's nuclear programme was far ahead of Pakistan's. He said such statements were meant solely for domestic consumption in India.

The pact remains that in the enrichment technology we have not only broken the monopoly of the Western world but have left India many years behind, he remarked.

Dr Khan said Indians would find it next to impossible to catch up with Pakistan, if they ever try, in the mastery of uranium enrichment by centrifuge method.

He said purely from the theoretical and academic point of view when we are capable of enrichment to 3 percent (i.e. reactor grade) there is nothing which stands in our way technically to stop us from enriching to 90 percent (weapons grade).

It is this possibility and capability (no matter how hypothetical it may be) that has perturbed India as well as a number of Western countries, Dr Khan wrote, while underlining the fact that Pakistan has done the job in a record time of 7 years and at a very modest cost, compared to 25-30 years taken by England, Holland and Germany at a cost of about $2,000 million.

Such an achievement in a country where no basic industrial infrastructure is available, speaks of itself, he added.

Dr Khan said enrichment of uranium is a herculean task and the most difficult of the whole fuel cycle which has been perfected only by seven or eight nations in the world. The Western nations had never imagined that a developing country like Pakistan could break their monopoly and be independent of them to carry her peaceful nuclear programme.

He repeated Pakistan President Ziaul Haq's offer that Pakistan and India should have a bilateral agreement to renounce nuclear weapons production and to throw open nuclear facilities on a reciprocal basis.

He said if Pakistan scientists and engineers could master sophisticated enrichment technology on their own despite worldwide embargo and restrictions on equipment, components and materials, it was not beyond their reach to manufacture nuclear weapons, should the need arise.

CSO: 5100/4728

MUNIR: ALL FOUR PROVINCES HAVE VAST URANIUM DEPOSITS

Karachi DAWN in English 10 May 84 p 2

[Text]

ISLAMABAD, May 9: The Chairman, Pakistan Atomic Energy Commission, Mr Munir Ahmed Khan, has disclosed that there are vast deposits of uranium in all the four provinces of Pakistan which are not only sufficient to meet the present requirements of the country, but also needs for a long time to come.

Speaking in a special programme "technology in Pakistan" broadcast by Radio Pakistan this afternoon he said that Pakistan would not have to import uranium for its proposed Chashma nuclear power project and other such projects to be implemented in the future.

Mr Munir Ahmed Khan said that negotiations were going on with a number of countries to acquire more atomic reactors to meet the rising needs of energy in Pakistan. Pakistan's policy was that it would purchase atomic reactors from only those sources which offer reasonable prices and terms. Pakistan, he said, was ready to consider offers to supply reactors from any friendly country.

Replying to a question he described as unwarranted and negative the propaganda against Pakistan's nuclear programme. He emphasised that the programme was wholly meant for peaceful purpose. He said the Commission wanted that the entire mass of Pakistani people should benefit from its nuclear energy programme.

He argued that current thermal and hydel sources of energy could not meet the rising national demands, making it imperative to shift to nuclear energy.

Speaking about the safeguards being sought for the Chashma project, he said that Pakistan was ready to accept the safeguards of International Atomic Energy Agency so far as Chashma project was concerned. But those installations which had been designed and built by indigenous efforts, resources and expertise, would not be subjected to international safeguards.

About Chashma project Mr Munir Ahmed Khan said that it was initially estimated to cost 1,800 million dollars, with a foreign exchange component of 1000 million dollars.

Negotiations to obtain the foreign exchange component and to settle the safeguards were currently going on, he said and added that Pakistan had conveyed its position to the supplier countries.

KANUPP

Talking about Karachi Nuclear Power Plant (KANUPP), he said that it was working in accordance with international safeguards. The Director General of IAEA, Hans Blix, who recently visited Pakistan, had said that the agency was fully satisfied that KANUPP had not violated any international safeguards.

Answering a question, Mr Munir Ahmed Khan said that KANUPP was at present working in desired manner and supplying energy to consumers in Karachi. The Commission had felt some difficulty in running the plant after Canada cut off its supplies in 1976. But later on the Pakistani engineers were able to meet all the requirements of KANUPP from domestic sources.

Referring to the salient features of Pakistan's nuclear programme, Mr Munir Ahmed Khan said that at present eight atomic medical centres were working in the country from which nearly one lakh people were benefiting annually. They include patients of cancer and other deadly diseases. One more medical centre was being established in Quetta which would start working in near future.

In agriculture sector, three atomic agricultural centres were functioning one each in NWFP, Punjab and Sind, he said. Better varieties of important crops like wheat, rice, cotton and gram had been evolved at these centres. Food preservation methods had also been evolved.

About contribution of Pakistani women in nuclear field, Mr Munir said there was a good talent available amongst young educated Pakistani girls for this field. According to him at present nearly 30 young female Pakistani scientists were working with the Atomic Energy Commission.—APP

CSO: 5100/4722

NEWSPAPER EDITORIAL ON NUCLEAR TECHNOLOGY

GF291730 Lahore NAWA-E WAQT in Urdu 20 May 84 p 3

[Editorial: "Pakistan--the Need and Right to Nuclear Energy"]

[Excerpts] The president of the U.S. Nuclear Society, Mr Hamilton (Leonson), has said that Pakistan has the full right to use nuclear energy for its requirements, especially since it is free from pollution and relatively cheaper than oil and coal. In another 30 years, every country of the world including oil-rich Saudi Arabia will have to set up nuclear power stations.

In view of dwindling oil and coal supplies, Pakistan felt the need for nuclear energy 25 years ago and a 100-megawatt nuclear power plant was set up in Karachi with Canadian assistance. Power production began from the Mangla and then Tarbela dam projects at that time and a plan was drawn up for a nuclear power plant at Chashma--the implementation of which was suspended when France refused to supply a reprocessing plant on U.S. insistance. India exploded a nuclear device in May 1974, but Canada refused to provide spare parts to Pakistan's only nuclear power plant due to pressure from the United States. Meanwhile Pakistan produced some fuel on a limited scale because the optimum level of production had not been reached by the power plant. Now Pakistan has invited international tenders for the Chashma power plant but the common consensus of opinion seems to be that due to the opposition of the influential Zionist lobby in the United States, none of the Western countries is ready to cooperate with Pakistan.

The Americans and other Western nations are producing propaganda--and they believe it as well--that if Pakistan has access to nuclear techniques it will manufacture a nuclear bomb and hand it over to Arab countries which will then drop it on Israel. This seems interesting as a fairytale but it is difficult even to imagine something so improbable. Pakistan has repeatedly declared at the highest level that its nuclear program is peaceful, and after being assured of this, the United States agreed to sell some arms to Pakistan.

U.S. Vice President George Bush confirmed that Pakistan's nuclear program was peaceful before he left on his trip to Asian countries, but whenever the mention of Pakistan's nuclear program comes up, the Zionist lobby begins airing its imaginary fears, ignoring the fact that their country has been cooperating with India which has exploded a nuclear device. It has also made arrangements

for India's needs be met by its allied countries such as France, the FRG and Italy.

In view of the cordial sentiments of friendship with Pakistan expressed by Mr George Bush on his departure, Pakistanis can only wait and see whether the U.S. opposition for the sake of opposition will continue or it will change its attitude as regards Pakistan's right or need as Mr. Hamilton (Leonson) has mentioned. Otherwise, it will prove that as far as the United States is concerned, Pakistan does not need any nuclear energy and biogas and solar energy should suffice!

CSO: 5100/4725

PAPER DEFENDS RIGHT TO HAVE NUCLEAR PROGRAM

GF290638 Rawalpindi HAIDAR in Urdu 14 May 84 p 3

[Editorial: "Nuclear Safeguards!"]

[Excerpts] The U.S. ambassador to Pakistan, his excellency Deane Hinton, addressed the Chamber of Commerce and Industry in Karachi, and in our opinion, the most important thing it talked about was Pakistan's nuclear program.

In simple words, what the U.S. envoy said is that Washington wants President Ziaul Haq to sign an agreement which would provide the United States with a guarantee that Pakistan will never manufacture an atomic nuclear weapons. The United States is impatient to sign such an agreement with the Ziaul Haq government--as if it fears that if sooner or later a democratic government is set up in Pakistan, it will refuse to sign such an agreement and might even embark on the manufacture of a nuclear weapon.

If we examine the implications of the U.S. envoy's utterances, it can easily be deduced that the United States wishes to extract a commitment which an elected democratic government in the future might not accede to.

Pakistan is a free and sovereign country and it is its right to implement a nuclear program when it wishes to. The concept of a halt to nuclear proliferation is laudable in itself, but in practice, Pakistan has a fundamental need not to lag behind India in the field of nuclear technology. The U.S. policymakers are aware that the Indian leaders are following a vigorous policy of imposing their preponderance on Southeast Asia. The United States is well aware that India, which exploded its first nuclear device 10 years ago, has gone far ahead in nuclear technology. The U.S. administration has given India a free hand as far as progressing in the fields of science and nuclear technology is concerned and it has also been unsuccessful in persuading India to sign the nuclear nonproliferation treaty. In view of the above facts, we think that such a demand by the United States is unreasonable that it would sign a certificate of nuclear guarantees....

In conclusion, we wish to make it clear to the U.S. envoy and his government that even if they succeed in getting President Ziaul Haq's government to sign such an illegitimate agreement, any future democratic government in Pakistan will not be bound by it because democratic governments are meant to safeguard national interests.

CSO: 5100/4725

BRIEFS

URANIUM ENRICHMENT ABILITY CLAIMED--Karachi, Pakistan, 22 May (AFP)--Pakistani nuclear physicist Abdul Qadir Khan said Pakistan has not only broken in Western monopoly in regard to the enrichment of uranium but left India many years behind. In an article in the latest issue of the English-language publication DEFENCE JOURNAL, Dr Khan said: "Having mastered this technology, it is theoretically, and I repeat theoretically, possible for us not only to manufacture atomic bombs, but also hydrogen bombs for which an enriched uranium bomb is used as a trigger." But he said Pakistan's nuclear programme was for peaceful purposes. Dr Khan, who was sentenced in abstentia to 3 years imprisonment by a Dutch court last year on charges of stealing nuclear secrets, said: "Purely from the theoretical and academic point of view, when we are capable of enrichment to 3 percent (reactor grade) there is nothing which stands in our way technically to stop us from enriching to 90 percent (weapons grade)." [Text] [BK221608 Hong Kong AFP in English 1557 GMT 22 May 84]

ZIA ON CHASHMA PLANT--President Mohammad Ziaul Haq has said the only solution to problem of energy shortage is the development of nuclear energy. He made this observation while speaking at a dinner hosted by the Karachi Chamber of Commerce and Industry last night. The president said the government is determined to acquire nuclear technology to meet the ever increasing energy demand for rapid industrialization. He said after the termination of cooperation by Canada, the Pakistani scientists have succeeded in generating up to 60 megawatts of nuclear energy at the Karachi nuclear power plant. The president said there is a plan to set up a 900-megawatt nuclear power plant at Chashma for which international tenders have been called. Sufficient quantity of uranium is available in the country for this project, but they will have to acquire machinery from the friendly countries. He made it clear that Pakistan is ready to accept all safeguards for Chashma project, but it is not fair to expect that Pakistan will submit to such safeguards for its entire nuclear program when other countries have not done so. [Text] [BK230425 Karachi Domestic Service in Urdu 0200 GMT 23 May 84]

CSO: 5100/4721

URANIUM PRODUCTION DROP

Johannesburg RAND DAILY MAIL in English 9 May 84 p 5

[Article by Brendan Ryan]

[Text]

CUTBACKS by uranium producers announced so far this year will, when fully implemented, equal a 14% reduction in uranium oxide output from 1983 levels.

Uranium oxide is produced largely as a by-product of gold mining operations. Production increased to 6 933 tons in 1983 from 6 605 tons in 1982.

This was largely due to new projects started when the uranium market appeared considerably stronger than it does now.

The principal new project was Gencor's Beisa mine — a primary uranium producer with gold as a by-product — which will be closed by the end of the year.

Beisa had been building up to full production in 1983. The mine's output in the March quarter this year was 153,4 tons.

At full output the mine would have contributed about 600 tons of uranium oxide annually to South African production.

Western Deep Levels, which produced 174 tons of uranium oxide in 1983, is also to cease uranium production completely.

The mine is to convert its uranium plant to gold treatment at a cost of R35m.

The other major cut in uranium production announced this year was by the Harmony gold mine in the Rand Mines group.

Harmony has closed the Merriespruit treatment plant, one of the mine's three uranium plants.

Harmony produced 630 tons of uranium in the year to June 1983. As the Merriespruit plant contributed 28% of this, its closure removes another 176 tons of uranium production.

In total, annual uranium production will be cut by some 950 tons over the next year as the announced cuts take effect.

More cuts are on the cards, with another 260 tons of annual uranium production to be lost later this year when Blyvooruitzicht stops its uranium operations.

By year-end the mine will be in a position where its stockpile meets the bulk of its future contractual commitments.

The chairman, Mr Dammy Watt, said in the last annual report that after August the costs of continuing to produce uranium would be so high that other options to meet supply commitments would be more profitable.

He did not specify the options but they could include buying the uranium for delivery to customers from other producers, such as sister mine Harmony.

Cutbacks announced before the latest round include the mothballing in 1982 of the Afrikander Lease uranium plant, which would have produced about 385 tons of at full output, and the end of production by

Gencor's West Rand Consolidated mine, also in 1982.

Anglo's Joint Metallurgical Scheme (JMS) dropped uranium production from an average of 244 tons a quarter in 1982 to 173 tons a quarter in 1983.

The reason for the cutbacks is the appalling state of the world uranium market. Spot prices have fallen back from $24/lb in September last year to $17/lb, which matches the market low reached in November 1982 after the high of about $44/lb in mid-1978.

Also hit by the market crunch is the world's largest mine, Rossing in SWA, which is run by the RTZ group.

Information on the mine's operations is hard to obtain as Rossing's management says it is not allowed to release exact production figures.

South African producers are not allowed to release details of sales volumes nor prices but may give production statistics.

Rossing's annual production capacity is 5 000 short tons. A company spokesman says only that the mine is producing at "slightly below" capacity.

The mine sells its entire output on long-term contracts to a wide spread of consumers.

Like all uranium producers the fall in the spot uranium prices has affected contract prices at Rossing, but mine management will not discuss the marketing situation other than to say price negotiations are not easy.

Japanese uranium consumers, in particular, have taken full advantage of current market conditions to hammer down the contract uranium prices towards spot market levels.

Uranium producers that have come off best so far have been those which hold contracts to supply European customers who have been the least affected by the environmental backlash against nuclear power programmes.

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